

10/528334

Ministry of Economic  
Development



Manatū Ōhanga

Intellectual Property Office  
of New Zealand

PCT/NZ03/00215

REC'D 15 OCT 2003

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## CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 20 September 2002 with an application for Letters Patent number 521505 made by Deep Video Imaging Ltd.

Dated 29 September 2003.

Neville Harris  
Commissioner of Patents, Trade Marks and Designs



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**PATENTS ACT 1953****PROVISIONAL SPECIFICATION**

5

**Multi-View Display**

We Deep Video Imaging Limited a New Zealand company of Airport Road, Mystery Creek, RD2 Hamilton, New Zealand do hereby declare this invention to be described in the following statement:

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## PROVISIONAL SPECIFICATION

### Multi-View Display

#### TECHNICAL FIELD

- 5 This invention relates to the field of electronic information display.

#### BACKGROUND ART

- In-car navigation systems and in-car entertainment systems are available as an accessory in new cars, or are available separately for retrofit. The displays for the systems are placed in or on top of the car dash board.
- 10 Since the displays are typically of the wide-viewing angle colour liquid crystal type, both the front passenger and the driver may see the display. The display may be supplied with information so that it forms part of the car's navigation system or part of the entertainment system at any one time. If an in-car entertainment system is fitted in view of the driver, it
- 15 must be disabled whilst the car is in motion, so not to distract the driver who is responsible for the safety of the vehicle. This is somewhat of a disadvantage as it is desirable for the front passenger, and only the front passenger, to view in-car entertainment. However it is also useful for the driver view the in-car navigation system whilst the vehicle is moving,
- 20 however with present systems this would interrupt the passenger's entertainment. A potential solution would be to supply separate displays to the passenger and driver, however this is expensive and takes up almost double the area. A second potential solution would be to have a switch to restrict the view only to the driver when the car is in motion,
- 25 however the driver still has the problem of disrupting the passenger's entertainment when the navigation system is required, and would have to fumble around to switch between the two creating a distraction.

Long aeroplane flights, now days up to 13 hours in length, are particularly boring for passengers. Airlines have attempted to alleviate this boredom by including projector systems on the aeroplanes to supply information about the journey and entertainment. However with the single projector  
5 system the entertainment is the same for each passenger, and there is no accounting for individual taste or interest. Again this problem can be alleviated with separate displays for each passenger, however this can prove expensive, requires the individual displays to be quite small, and can add significant weight to the plane increasing costs for airlines.

10

At present there exist methods to produce displays where several imaging planes are stacked with set distances between them. These imaging planes may also be stacked as closely as possible. In a preferred embodiment these displays consist of a high-brightened backlight, a rear  
15 image panel which is usually an active matrix, colour display, a diffuser and a front image plane, which are laminated to form a stack. There are generally colour filter stripes, and a black matrix on each display which defines the borders of the pixels. However it should be appreciated that the following discussion applies to all image planes that are addressed by  
20 passive or active matrices or have colour filters arranged in any periodic pattern. For the purposes of the present invention these image planes may not be addressable at all.

Multi-domain polarised liquid crystal displays can consist of the following  
25 layers:

- polarizer
- compensation film
- rear glass
- 30 -electrodes and transistors
- polyvinyl 4-methoxy cinnamate photopolymer alignment layer
- liquid crystal

-polyvinyl 4-methoxy cinnamate photopolymer alignment layer

-ITO

-Protection layer (methyl methacrylate) or similar

-Colour filter layer

5 -Glass substrate

-Compensation film

-Polarizer

10 The polyvinyl 4-methoxy cinnamate photopolymer alignment layer hereafter called the photopolymer alignment layer can be used to control the orientation of the liquid crystal molecules closest to the layer.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

15 Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

#### DISCLOSURE OF INVENTION

20 a) A single display whereby the viewing plane is a single differentiable surface where independent content or information is available to multiple viewers depending on their viewing angle relative to the display

25 b) A single display whereby the viewing plane is composed of separate surfaces layered parallel in the direction perpendicular to the surfaces where independent content or information is available to multiple viewers depending on their viewing angle relative to the display

c) A instrumentation system where different information is viewable

by different occupants depending on their viewing angle relative to the display

- 5 d) An entertainment system suitable for confined spaces where different content is available to different occupants depending on their viewing position.
- e) A display system where the content may be presented to two different viewers, but a viewer may be restricted to viewing particular content depending on external circumstances.
- 10 f) A display system where the same content may be presented to two different viewers, but a viewer may be restricted to viewing specific content only while the vehicle is stationary.
- g) A display system where the same content may be presented to two different viewers, but a viewer may be restricted to viewing only an in car navigation system while the vehicle is stationary.
- 15 h) A display as claimed above where the viewing angle of different content is controlled by using a multi-domain pixel.
- i) A display as claimed above where there are common electrodes for each pixel, where the states of function and non function of each sub pixel may be controlled by applying a threshold voltage .
- 20 j) A display as claimed above where sub-pixels with different domains, for presenting information to different viewers are separately addressed.
- k) A display as claimed above where information is restricted to viewers by use of a lenticular lens.
- 25 l) A display as claimed above that is able to be rotated to portrait mode for an occupant viewing navigation

Reference throughout this specification will now be made to the present invention as applying to video display systems. However, it should be appreciated by those skilled in the art that other types of display and imaging systems may be used in conjunction with the invention, not necessarily being video screens.

The viewing angle of liquid crystal displays can be controlled by the orientation of the liquid crystal molecules with respect to the glass substrates that form the display. Optimum viewing angle here means the direction a viewer looks in where the display contrast, the ratio between the luminance of the light and dark states of the display, is at a maximum. Orientation here is defined as a three-tuple where each element gives the magnitude of the angle between the x, y, and z axes respectively where the x, y and z axes are aligned parallel with the horizontal, vertical and normal directions of the display respectively.

It has previously been considered undesirable for displays to have a narrow viewing angle because this prohibits multiple users from viewing the same image. However in the case of a car navigation and entertainment system it would be desirable for the driver to be able to see navigation information, and only navigation information and the passenger to see entertainment, and only entertainment. Because of the limited space and cost constraints it would be useful for both passengers to have different views of the same display.

A conventional non-layered, non-compensated colour liquid crystal display, appears white when seen from a viewing direction far from the optimal. In the multi-layered setup as described above the display will appear transparent. Hence in the multi-layered setup described above if the driver was looking at the rear image layer with a viewing direction of about 60 degrees in the plane perpendicular to the floor and parallel with the horizontal and with the front image layer with an optimal viewing direction of -60 degrees in said plane then the driver will be able to see the

image on the rear image layer and not on the front image layer. Conversely the passenger, sitting to the other side of the display, can see only information from the front image layer. Hence the passenger can view entertainment only and the driver can view navigation only. Thus  
5 limited viewing angle, which was previously considered as a disadvantage in the industry, combined with multiple layered displays can be used to multiplex images to multiple viewers which is an unexpected advantage.

### BRIEF DESCRIPTION OF DRAWINGS

10 Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 Is a diagrammatic view of a combined in-car navigation and entertainment display. A viewer (1) looking at the display (5) in the direction shown sees a movie being played (3), whilst a  
15 viewer (2) looking at the display in the direction shown sees the navigation system (4).

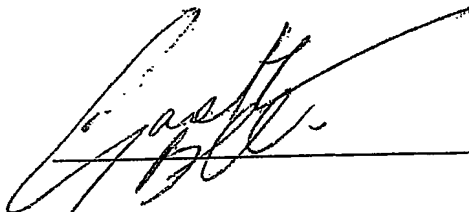
Figure 2 Shows a diagrammatic view of the multi-layered embodiment where an image (3) is displayed on the first layer (5) with an optimum viewing direction (6) and an image (4) is displayed  
20 on the second layer (7) with an optimum viewing direction (8)

### BEST MODES FOR CARRYING OUT THE INVENTION

A first layer with optimum viewing direction (6) is placed substantially collinear and as close to a second layer with an optimum viewing direction  
25 (8). In most cases there will be a diffusion layer (9) to abate moiré interference. The displays are backlit using either direct view lamps or a light pipe (10). A viewer viewing at an angle (6) will see image (3), and a viewer looking in direction (8) will see image (4).



Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof.

A handwritten signature in black ink, appearing to read 'Gareth Bell', is written over a horizontal line.

Gareth Bell

for

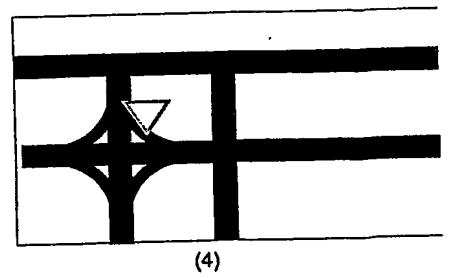
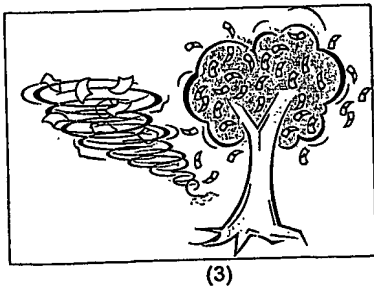
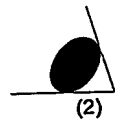
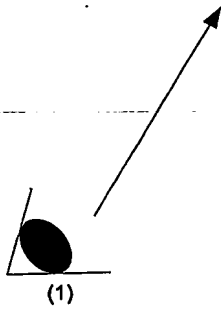
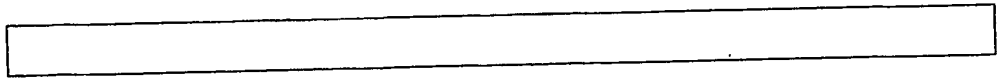
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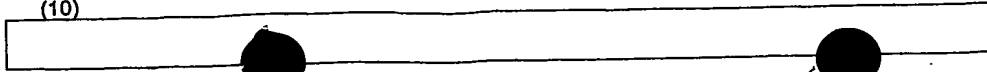
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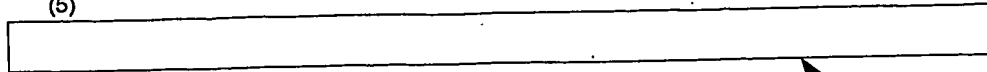


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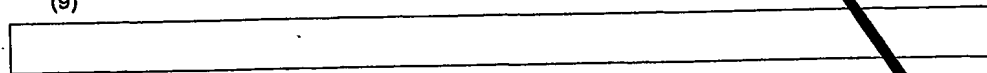
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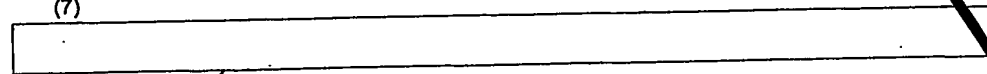
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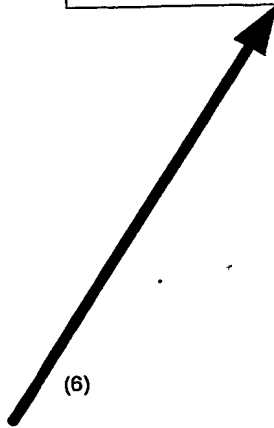
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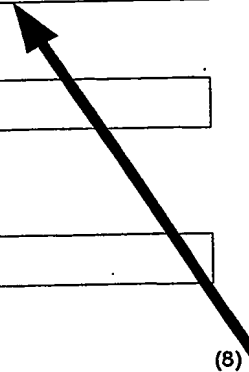
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